CLAIMS

I claim:

1. A traffic monitoring system comprising:

a video processor that is configured to receive an image from a camera having a field of view that includes a roadway, and

a pattern recognizer that is configured to identify headlight patterns in a recognition zone within the image, and to thereby distinguish vehicles within the recognition zone;

wherein

the vehicles include headlights that are characterized as producing

a broad segment of projected light and

a narrower segment of higher intensity light;

the recognition zone corresponds to a segment of a field of view of the camera wherein

reflected light received from reflection areas that are illuminated by the narrower segments of higher intensity light is substantially diminished and

the projected light from the headlights is received directly; and

the headlight patterns correspond to the projected light from the headlights.

2. The traffic monitoring system of claim 1, further comprising:

a zone extractor that is configured to extract a sub-image from the image corresponding to the recognition zone.

3. The traffic monitoring system of claim 1, further comprising

a memory for storing prior images from the camera, and

wherein

the pattern recognizer is further configured to track a path of each of the vehicles based on corresponding headlight patterns in the prior images.

4. The traffic monitoring system of claim 1, wherein

the pattern recognizer is further configured to increment a count for each identified new headlight pattern, corresponding to a newly distinguished vehicle.

5. The traffic monitoring system of claim 1, wherein

the segment of the field of view of the camera:

does not include the reflection area when the camera is within a predominant path of the reflected light from the reflection area, and

includes the reflection area when the camera is not within the predominant path of the reflected light from the reflection area.

6. The traffic monitoring system of claim 1, further including

a traffic analyzer that is configured to provide traffic analysis information based on information received from the pattern recognizer regarding distinguished vehicles.

7. The traffic monitoring system of claim 1, wherein

the pattern recognizer is further configured to:

identify light patterns within the image, and

identify combinations of light patterns within the image that are consistent with characteristics of vehicle headlights, including at least one of:

a distance between the light patterns, and

a pairing of light patterns based on a consistent track of each of a pair of light patterns.

8. A traffic monitoring system comprising:

a video processor that is configured to receive a sequence of images from a camera having a field of view that includes a roadway, and

a tracking system that is configured to identify tracks of illumination patterns within the sequence of images, and

a reflection detector that is configured to distinguish illumination patterns that correspond to reflections, based on the tracks of the illumination patterns.

9. The traffic monitoring system of claim 8, wherein

the tracks of the illumination patterns that correspond to reflections are substantially shorter than the tracks of illumination patterns that correspond to vehicle headlights.

10. The traffic monitoring system of claim 8, wherein

the tracks of the illumination patterns that correspond to reflections end substantially before an edge of the field of view of the camera.

11. The traffic monitoring system of claim 8, wherein

the tracking system includes

a threshold detector that identifies the illumination patterns as patterns in each image of the sequence of images that exceed a threshold luminance level.

12. A method of detecting a vehicle, comprising:

receiving an image from a camera having a field of view that includes a roadway,

identifying one or more headlight patterns within a recognition zone of the image, and

detecting the vehicle based on the one or more headlight patterns;

wherein

the vehicle includes headlights that are characterized as producing

a broad segment of projected light and

a narrower segment of higher intensity light; and

the recognition zone corresponds to a segment of the field of view of the camera wherein

reflected light received from a reflection area of the roadway that is illuminated by the narrower segment of higher intensity light is substantially diminished, and

the projected light is received directly.

13. The method of claim 12, wherein

detecting the vehicle includes identifying a newly occurring headlight pattern in the one or more headlight patterns.

14. The method of claim 12, wherein

the segment of the field of view of the camera:

does not include the reflection area when the camera is within a predominant path of the reflected light from the reflection area, and

includes the reflection area when the camera is not within the predominant path of the reflected light from the reflection area.

15. The method of claim 12, further including

determining a path of the vehicle based on prior images from the camera.

16. The method of claim 12, further including

incrementing a count when the vehicle is detected.

17. The method of claim 12, further including

detecting other vehicles based on the one or more headlight patterns, and

providing one or more traffic analysis reports based on the detected vehicles.

18. A method of detecting vehicles, comprising:

maintaining one or more tracks corresponding to a series of consistent illumination patterns from a series of images from a video camera,

distinguishing each illumination pattern corresponding to each vehicle from each illumination pattern corresponding to each reflection from each vehicle based on a length of each of the one or more tracks.

19. The method of claim 18, wherein

maintaining the one or more tracks includes:

identifying an illumination pattern in a current image from the video camera corresponding to vehicle headlights, and

identifying a similar illumination pattern in a prior image from the video camera.

20. The method of claim 18, wherein

the tracks of the illumination patterns that correspond to reflections end substantially before an edge of the field of view of the camera.

21. The method of claim 18, further including

identifying the illumination patterns as patterns in each image of the sequence of images that exceed a threshold luminance level.

22. A computer program for execution on a processing device that causes the processing device to:

identify illumination patterns in a series of images from a video camera, and

distinguish vehicles from reflections based on tracks of the illumination patterns in the series of images.

23. The computer program of claim 22, wherein

the vehicles are distinguished from the reflections based on a length of each track.

24. The computer program of claim 22, wherein

the vehicles are distinguished from the reflections by identifying patterns within an identification region that is beyond an extent of the tracks of the illumination patterns of the reflections in a field of view of the video camera.